



## ***Mother-Infant Bonding: A Bibliometric Analysis*** **Anne Bebek Bağlanması : Bir Bibliyometrik Analiz**

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### **Abstract**

**Introduction:** Mother-infant bonding serves as a template for all relationships a person forms throughout his/her life and can be critical to any relationship a person will form. The aim of this study was to determine the development and current state of research on mother-infant bonding in the literature.

**Method:** The Web of Science (Wos) database was used to analyse bibliographic data between 1994 and 2022 (April) using the keyword "mother-infant bonding". Graphics, science maps, and analyses were created with the data.

**Findings:** The results of the WoS online database show that there are 50 documents and 41 resources (e.g. books, journals) related to publications about the term "mother-infant bonding" for the years between 1994 and 2022. The works of 221 authors were accessed. It was observed that keywords such as 'postnatal depression', 'postpartum depression', and 'symptoms' were used more frequently from 2015 onwards. It was observed that keywords such as 'depression', 'attachment', 'scale', and 'version' were used less frequently after 2017. The USA, Japan, and Germany were the top three countries in terms of number of publications and citations in the country comparisons.

**Results:** This study shows that research on mother-child bonding has increased in recent years. Data on priorities and trends in studies can help guide future academic research.

**Keywords:** mother- infant bonding, bonding, bibliometric, postpartum

### **Özet**

**Giriş:** Anne bebek bağlanması, kişinin hayatı boyunca kurduğu bütün ilişkiler için bir taslak arz eder ve kişinin kuracağı her ilişkide belirleyici olabilmektedir. Bu çalışmada anne bebek bağlanması hakkındaki çalışmaların literatürdeki gelişimini ve mevcut durumunu belirlemek amaçlandı.

**Yöntem:** 1994 ve 2022 (Nisan) yılları arasında "Mother- infant bonding" anahtar sözcüğü, Web of Science (WoS) veritabanı kullanılarak bibliyografik verileri analiz etmek için kullanıldı. Veriler üzerinden grafikler, bilim haritaları ve analizleri yapıldı.

**Bulgular:** WoS çevrimiçi veritabanı sonuçlarına göre, 1994-2022 "Mother- infant bonding" terimi ile ilgili yayınlara ilişkin 41 kaynak (ör. dergi, kitap) ve 50 belge bulunmaktadır. 221 yazarın eserine ulaşıldı. 2015 yılından bu yana 'postnatal depression', 'postpartum depression', 'symptoms' gibi anahtar kelimelerin kullanım sıklığının arttığı gözlemlendi. 2017 yılından sonra 'depression', 'attachment', 'scale', 'version' gibi anahtar kelimelerinin kullanım sıklığının ise düşmüş olduğu gözlemlendi. Ülke karşılaştırmalarında ise yayın ve atıf sayısından ilk üç sırada yer alan ülkeler Amerika Birleşik Devletleri, Japonya ve Almanya idi.

**Sonuç:** Bu çalışma, anne-bebek bağlanması araştırmalarındaki ilerlemenin son yıllarda arttığını göstermiştir. Araştırmaların öncelikleri ve eğilimlerine ilişkin saptanan veriler gelecekteki akademik arayışlara yardımcı olabilir.

**Anahtar Kelimeler:** anne- bebek bağlanması, bağlanma, bibliyometrik, postpartum.

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## Introduction

Bonding, which begins with the mother-infant relationship, acts as a template for all of the relationships that a person forms throughout his or her life and has the potential to be crucial in each of them<sup>1</sup>. Mother-infant bonding is the existence of a warm, ongoing, and close relationship between a mother and child, and both parties are content and enjoy this situation<sup>2</sup>. Taylor et al.<sup>3</sup> defined bonding as the mother's feelings towards the infant and separating this process from observable behaviours.

After the baby has his/her first secure-insecure attachment experience, this bond will last a lifetime. The child may experience issues with social, mental, and emotional development starting in infancy if secure bonding does not take place<sup>4</sup>. Mother-infant bonding promotes the child's healthy development and has a positive impact on the child's life. Therefore, the mother's response to her child from birth is crucial<sup>2</sup> (2). Children who have poor parent-child relationships are more susceptible to a variety of negative outcomes<sup>5</sup>. For this reason, numerous studies have measured the degree of mother-infant bonding and attempted to determine how it relates to various conditions<sup>6,7</sup>.

Bibliometric analysis is a method that has recently been used in academic research to search and analyze vast and dispersed data. While it allows us to show how a field has changed over time, it also allows the literature to be updated with the most recent techniques and approaches in that field<sup>8</sup>.

Mother-infant attachment is of great importance in the practice of family medicine, which is the principle of a biopsychosocial approach that starts to follow a person when he/she is still a foetus, continues in every age of his/her life and continues until death. It has been noted that there is no research on mother-infant bonding, which has an impact on a person's entire life, on the evaluation of bibliometric analysis in the literature.

The purpose of this study was to create a resource for information on mother-infant bonding. All documents containing the keywords 'mother-infant bonding' in the academic literature were analysed using the bibliometric method to guide future academic studies.

## Method

Keywords that capture the main topics of the paper help indexing in the medical literature. Keywords reflect the region of interest, the modality, and procedure used, and the pathological process studied<sup>9</sup>. The term 'mother-infant bonding' is the keyword that is considered important for this study. The Web of Science (WoS) database was used to analyse bibliographic data between 1994 and 2022 (April) using the keyword 'mother-infant bonding.' The WoS database was chosen for this study as it contains more research data than other online databases.

The bibliometric analysis 'Bibliometric R-package' program was used to conduct data analyses. Graphs, science maps, and all analyses of the data were created by using the Bibliometric R – package<sup>10</sup>.

This study was graphically organised and visually supported<sup>11</sup> using the VOSviewer software<sup>12</sup>.

## Results

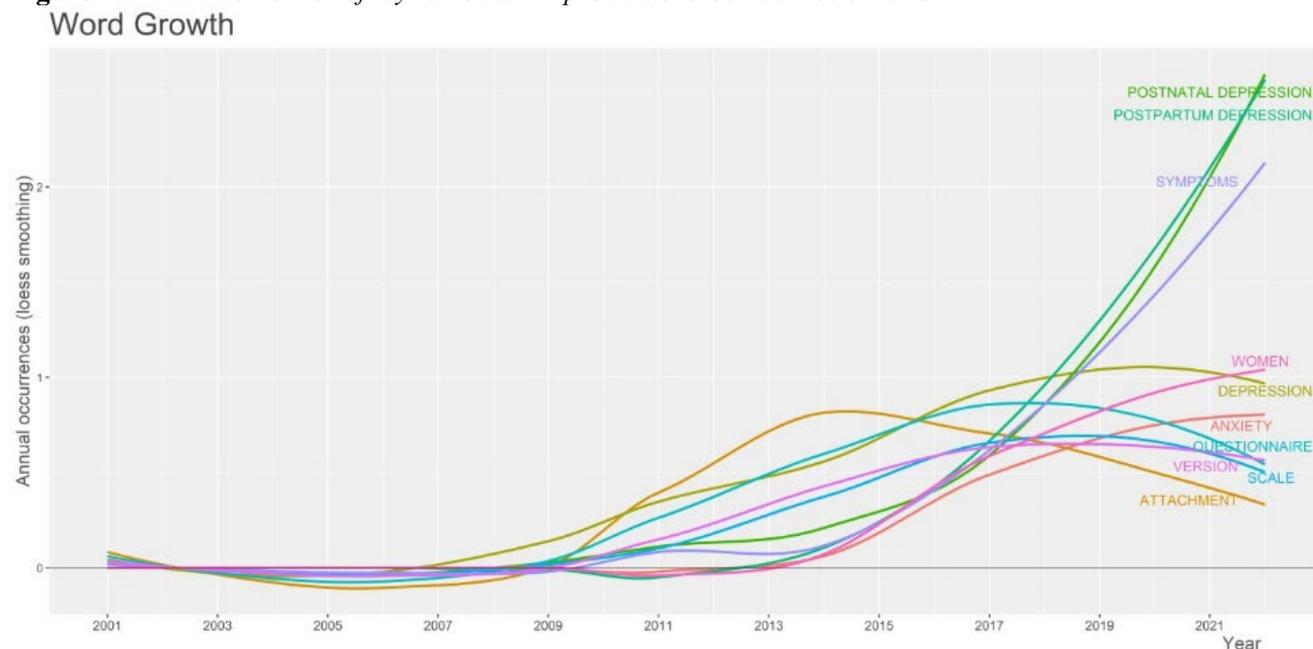
The results of the Web of Science (WoS) online database show that there are 50 documents and 41 resources (such as books and journals) related to publications about the term 'mother-infant bonding' for the years between 1994 and 2022. Forty four of these documents were articles, and 3 were reviews. The works of 221 authors were accessed. The number of studies with multiple authors was determined as 219 (Table 1).

**Table 1.** Main statistical information of mother-infant bonding articles in WOS.

Description	WOS
Timespan	1994:2022
Sources (Journals, Books, etc)	41
Documents	50
Average years from publication	4,77
Average citations per documents	16,98
Average citations per year per doc	2,665
<b>Document types</b>	
Article	41
Article; early access	3
Review	3
<b>Document contents</b>	
Keywords plus (ID)	208
Author's keywords (DE)	152
<b>Authors</b>	
Authors	221
Author appearances	233
Authors of single-authored documents	2
Authors of multi-authored documents	219
<b>Authors collaboration</b>	
Documents per author	0,226
Authors per document	1,79
Co-authors per documents	2,43
Collaboration index	2,23

Evaluation of the data in WoS with the help of bibliometric analysis is shown with a representative figure showing the annual distribution of the keywords used in publications (1994; 2022) by color and the frequency of use by years. It was observed that keywords such as ‘postnatal depression’, ‘postpartum depression’, and ‘symptoms’ were used more frequently from 2015 onwards. It was seen that keywords such as ‘depression’, ‘attachment’, ‘scale’, and ‘version’ were used less frequently after 2017 (Figure 1).

**Figure 1.** Annual distribution of keywords used in publications between 1994 and 2022

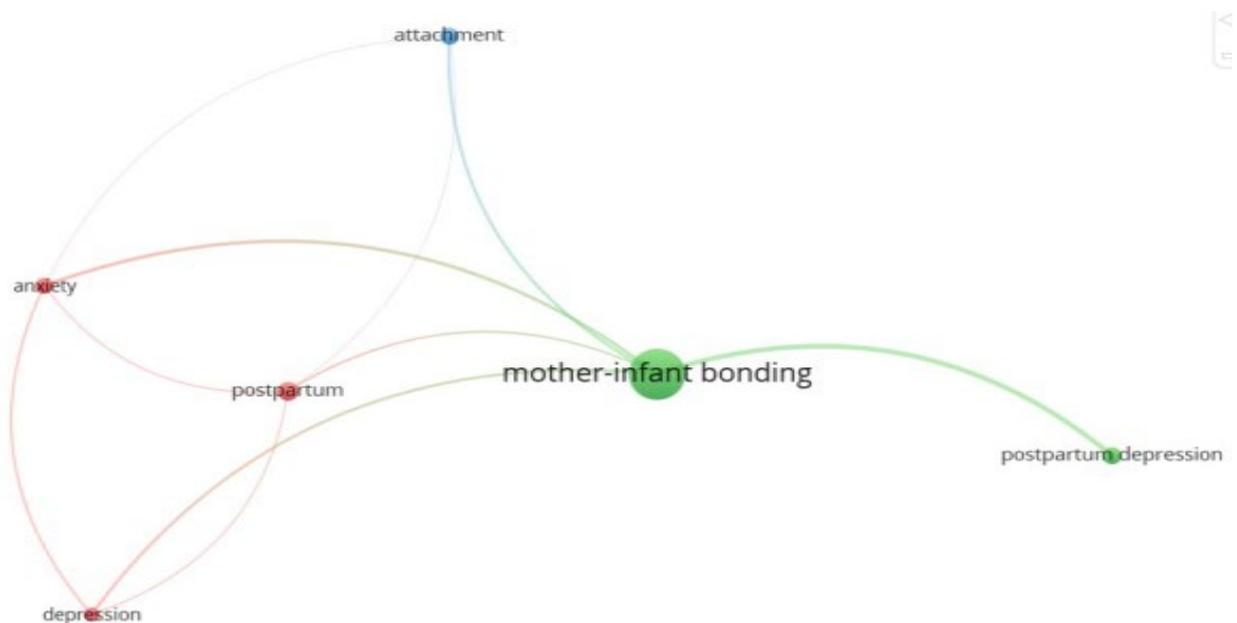


The total number of keywords used between 1994 and 2022 was 208, and the number of words used by the authors was 152 (Table). The thickness of the lines and links between the keywords show the relationships between the words. In the bibliometric analysis, the most frequently used words by the authors in the abstracts are ‘mother-infant bonding’, ‘postpartum’, ‘postpartum depression’, respectively, as shown in word cloud (Figure 2A). In the bibliometric analysis of the data in WoS, it was seen that the most used keywords were ‘mother-infant bonding’, ‘postpartum’, and ‘postpartum depression’. The relationships between mother-infant bonding terms and other words were observed to be stronger than the others (Figure 2B).

**Figure 2. (A)** Word cloud of the authors' most prominent keyword choices in the abstract.



**Figure 2. (B)** The most frequently used keywords by the authors between 1994 and 2022, and the relationship between them.



The diagram is used to show the profiles, relationships, and evolutions of the themes during this time period. Figure 3 shows the shift in the authors' published keywords over time after bibliometric analysis of the data in WoS were performed. The figure shows the change in the use of the keyword of 'attachment' in previous years (1994-2019) towards the use of the word 'bonding' between 2020 and 2022. It can be seen that the keywords 'mother-infant bonding' shifted towards the terms 'postpartum,' 'postpartum depression', and 'anxiety' between 2020 and 2022 (Figure 3).

**Figure 3.** *The change in the keywords used by the authors between 1994 and 2022*

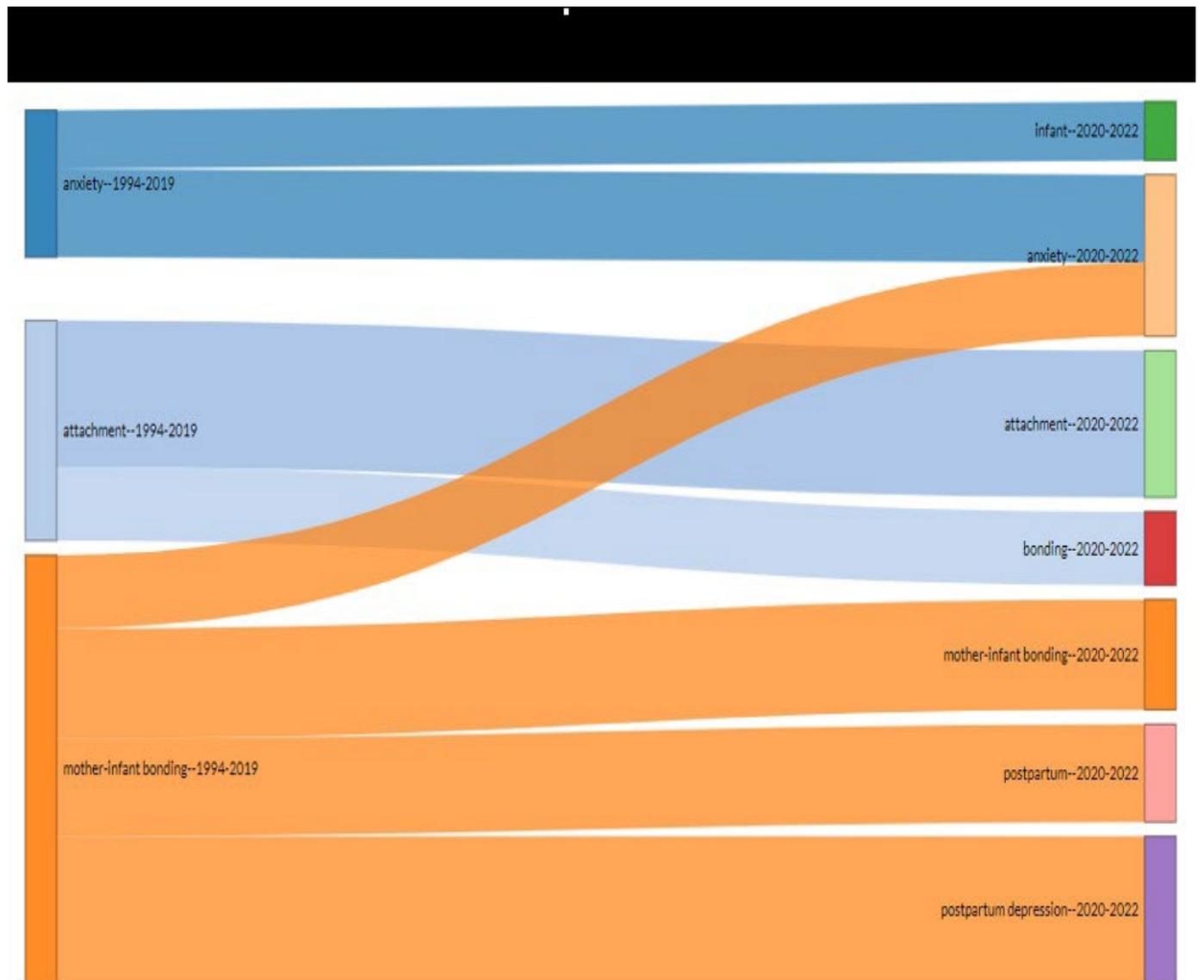
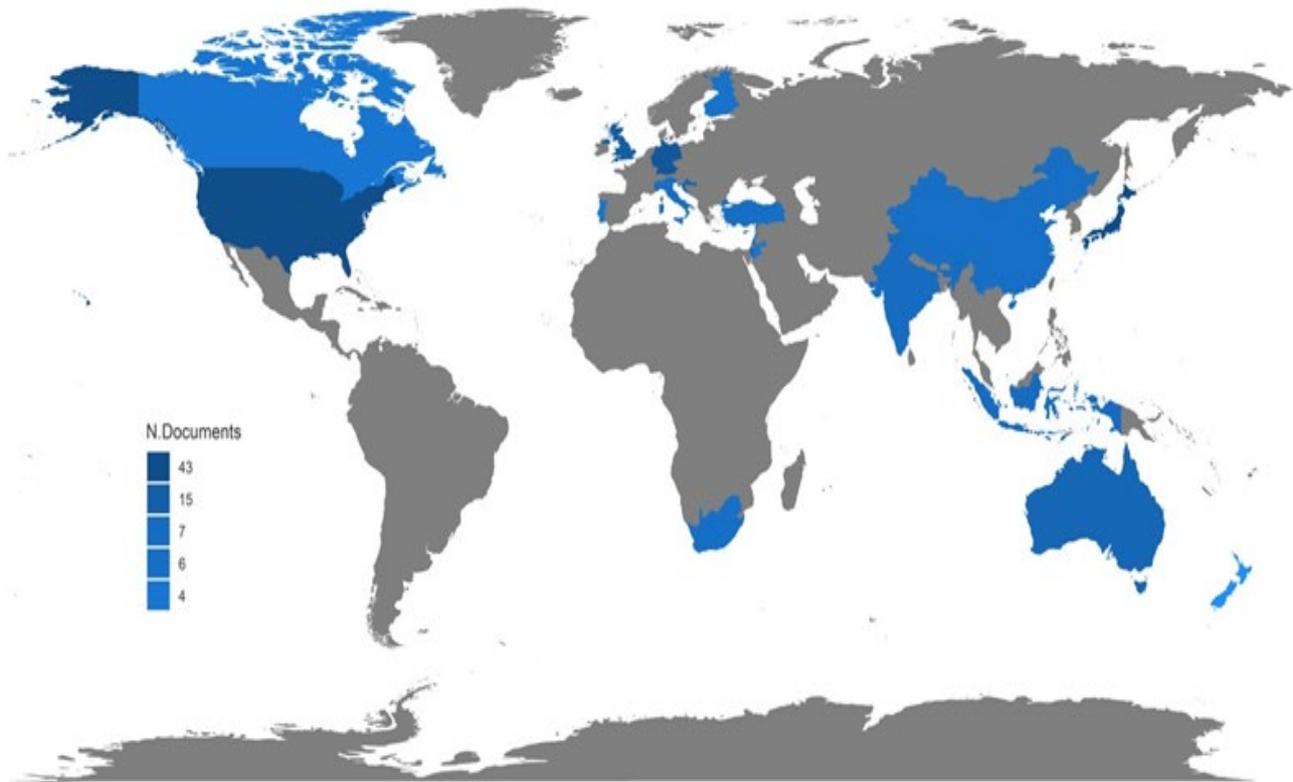


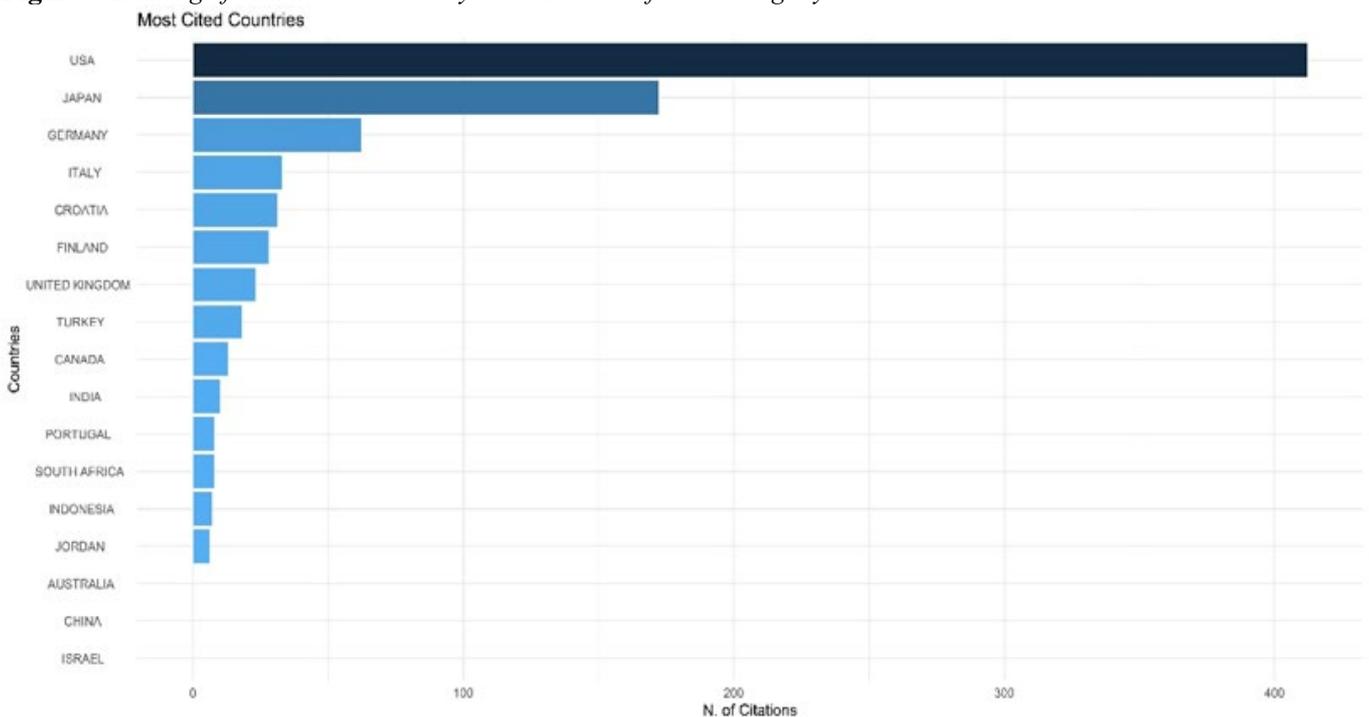
Figure 4 shows country level comparison of the research networks and the number of studies on ‘mother-infant bonding’. When we look at the geographical distribution of international publications related to our keywords, it is seen that the studies on ‘mother-infant bonding’ were produced in many countries on an international scale, although they had different degrees of productivity.

**Figure 4.** Geographical distribution of international publications with the keyword ‘mother-infant bonding’.



In terms of the citation ranking of the countries with the keywords ‘mother-infant bonding’, the top 10 countries were the USA, Japan, Germany, Italy, Croatia, Finland, United Kingdom, Turkey, Canada, and India (Figure 5)

**Figure 5.** Ranking of countries with the keyword ‘mother-infant bonding’ by citation count.



## Discussion

### *General trends in mother-infant bonding*

The current state of research on mother-infant bonding was analysed in this study using the bibliometric method. It was observed that the number of publications about mother-infant bonding increased in the last 5 years. This suggests that this subject is becoming more and more important.

The USA and Japan were the top two countries in terms of the number of publications and citations, suggesting that these countries have a significant influence on the development of mother-child bonding and may be involved in extensive international collaboration. Germany, which was the third country with the highest number of citations and publications, is active in this area as well. Additionally, as it can be seen from the geographical distribution, research on this topic in numerous nations reveals that this problem affects all of humanity, not just one particular society (Figures 4,5).

Author analyses revealed that Numan M's article was the most cited worldwide in mother-infant bonding research<sup>13</sup>. With his various studies<sup>13-15</sup> on this topic, it is clear that he made significant contributions to the management and analysis of maternal bonding research.

### *Mother-infant bonding interactions*

In this study, it was discovered that studies on mother-infant bonding used the terms 'postnatal depression,' 'postpartum depression,' and 'symptoms' more frequently lately. This suggests that mother-infant bonding is mostly likely to be associated with these factors.

Effective and complete mother-infant bonding has been associated with many individual or environmental factors<sup>16,17</sup>. The development of this bond is positively influenced by circumstances such as feeling the fetal movements during pregnancy, listening to music, education, massaging the newborn after birth, receiving support from the family, and having skin-to-skin contact with the baby<sup>18</sup>. On the other hand, the maternal depression, isolation, lack of support, separation from the baby, and unintended pregnancy can all have a negative impact on the mother-infant bonding<sup>19</sup>. In this study, the frequent use of words identified such as 'postpartum depression', 'anxiety', 'postpartum', 'symptoms', and 'factors', which negatively affect mother-infant bonding, shows that the situations affecting bonding have been examined.

Motherhood is accepted as a dynamic transition process due to its impact on the life balance of women<sup>20</sup>. Therefore, it is important to examine the early mother attitudes and feelings that influence her relationship with her child<sup>6</sup>. There are scales to evaluate the mother-infant bonding level. These scales, in the form of questionnaires, are very helpful for determining whether a relationship has broken down during the initial meeting with a mother<sup>21</sup>. There are various tools that evaluate bonding. Examples of some of these tools are *Maternal Attachment Inventory* (MAI), *Mother Infant Attachment Scale* (MIAS), *Mother and Baby Interaction Scale* (MABISC), *Maternal Postnatal Attachment Scale* (MPAS), *Postpartum Bonding Questionnaire* (PBQ), *Mother-to-Infant Bonding Scale* (MIBS), *Mother-to-Infant Relations and Feelings Scale* (MIRFS), and *Mothers' Object Relations Scales Short Form* (MORS-SR)<sup>20,22</sup>. In this bibliometric study, it was seen that the word scale was included in the word cloud. This suggests that the measurements related to bonding have achieved a considerable progress.

The relationship between postpartum bonding and emotional well-being cannot be ignored<sup>20</sup>. A healthy postpartum also promotes favourable psychological changes in mothers' perceptions. After a traumatic birth, interventions are recommended to help the mother's psychological recovery<sup>23</sup>. It was found in this study that the words 'maternal and health' were also used frequently. The fact that maternal health is on the agenda of studies shows that this issue has not been ignored by the researchers.

Currently, 10% of children and teenagers experience mental disorders worldwide<sup>24</sup>. Perinatal complications include parental psychological factors as well as somatic and intrauterine environmental factors for child mental development<sup>25</sup>. Postpartum depression occurs in at least 10% of mothers<sup>26</sup>. The prevalence of the deterioration of the bond between mother and child one year after birth is at least 5%, and this may negatively affect the mother, child, family, and public health. The mother-infant bonding is reported to significantly affect children's long-term development, according to numerous studies. For instance, a healthy maternal bond enhances the health and well-being of infants by affecting the positive cognitive, neuro-behavioural, and socio-emotional development, physical and emotional health, and interpersonal connections of newborns, children, and youth. In contrast, all of these developmental characteristics are adversely impacted by inadequate bonding<sup>27,28</sup>. As a matter of fact, in this bibliometric analysis, it was seen that topics such as 'perinatal', 'stress', 'care', 'social', 'development', 'parenting', and 'birth' were addressed in studies.

The term 'bonding' is synonymous with attachment, but it is also used to describe how parents get emotionally attached to their newborn in the first few hours after birth<sup>6</sup>. In this bibliometric analysis, it was found that the word 'attachment' was used less frequently and the word 'bonding' was used more frequently in studies published after 2017.

### ***Limitations***

This study used a bibliometric approach to determine the current status of publications, authors, journals, and keywords that provide an overview of their research on mother-infant bonding. There were some limitations in the study. The dataset was mainly from the WoS database. The reason is that WoS is the most widely used database in scientometrics, and the WoS format can be used in most bibliometric software. The results could have been more comprehensive if other databases such as PubMed or Scopus had been also used. Given that studies on the topic are still ongoing, although suggesting a major advancement in their study on this topic, new publications with low citation counts might also have been ignored because of their low citation counts.

### **Conclusions**

This study shows that research into mother-child bonding has increased considerably in recent years. The countries that contributed most to mother-infant bond research were the USA and Japan. The postpartum period, and particularly postpartum depression, have been popular topics in mother-infant bonding research in recent years.

The family physician is the primary healthcare provider to whom both the mother and the baby frequently consult. Family medicine practice and academic studies should place greater emphasis on mother-infant bonding as it significantly impacts a person's entire life. Data on priorities and trends of studies can help future academic research.

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## References

1. Çınar N, Yalınzoğlu Çaka S, Topal S, Uslu Yuvacı H. Relationship between prenatal and maternal attachment: a longitudinal study from Turkey. *J Obstet Gynaecol.* 2022;42(2):220-227. doi:10.1080/01443615.2021.1904223
2. Bowlby J. The nature of the child's tie to his mother. *International Journal of PsychoAnalysis.* 1958;39:350-373.
3. Taylor A, Atkins R, Kumar R, Adams D, Glover V. A new Mother-to-Infant Bonding Scale: links with early maternal mood. *Arch Womens Ment Health.* 2005;8(1):45-51. doi:10.1007/s00737-005-0074-z
4. Kavlak O., Şirin A. The Turkish version of maternal attachment inventory. *International Journal of Human Sciences.* 2009; 6: 188-202.
5. Kidd KN, Prasad D, Cunningham JEA, de Azevedo Cardoso T, Frey BN. The relationship between parental bonding and mood, anxiety and related disorders in adulthood: A systematic review and meta-analysis. *J Affect Disord.* 2022;307:221-236. doi:10.1016/j.jad.2022.03.069
6. Wittkowski A, Wieck A, Mann S. An evaluation of two bonding questionnaires: a comparison of the Mother-to-Infant Bonding Scale with the Postpartum Bonding Questionnaire in a sample of primiparous mothers. *Arch Womens Ment Health.* 2007;10(4):171-175. doi:10.1007/s00737-007-0191-y
7. Kolk TA, Nath S, Howard LM, Pawlby S, Lockwood-Estrin G, Trevillion K. The association between maternal lifetime interpersonal trauma experience and perceived mother-infant bonding. *J Affect Disord.* 2021;294:117-127. doi:10.1016/j.jad.2021.06.069
8. Donthu N, Kumar S, Mukherjee D, Pandey N, & Lim W M. How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research.* 2021;133, 285-296. <https://doi.org/10.1016/j.jbusres.2021.04.070>.
9. Peh WCG, Ng KH. Abstract and keywords. *Singapore Medical Journal.* 2008;49(9), 664-6.
10. Bozkurt AS. Publication Status of Mouse Embryonic Fibroblast Cells in Scientific Journals. *European Journal of Therapeutics.* 2021;27(2),135-141. <https://doi.org/10.5152/eurjther.2021.20111>.
11. Rodrigues S P, van Eck NJ., Waltman L & Jansen FW. Mapping patient safety: a large-scale literature review using bibliometric visualisation techniques. *BMJ open.* 2014;4(3), e004468. <https://doi.org/10.1136/bmjopen-2013-004468>
12. van Eck NJ, & Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics.* 2010;84(2),523–538. <https://doi.org/10.1007/s11192-009-0146-3>.
13. Numan M & Young LJ. Neural mechanisms of mother-infant bonding and pair bonding: Similarities, differences, and broader implications. *Hormones and behaviour.* 2016;77, 98–112. <https://doi.org/10.1016/j.yhbeh.2015.05.015>.
14. Febo M, Numan M, & Ferris CF. Functional magnetic resonance imaging shows oxytocin activates brain regions associated with mother-pup bonding during suckling. *The Journal of neuroscience : the official journal of the Society for Neuroscience.* 2005;25(50),11637–11644. <https://doi.org/10.1523/JNEUROSCI.3604-05.2005>
15. Elmadih A, Wan MW, Numan M, Elliott R, Downey D & Abel KM. Does oxytocin modulate variation in maternal caregiving in healthy new mothers? *Brain research.* 2014;1580, 143–150. <https://doi.org/10.1016/j.brainres.2014.01.020>
16. de Cock E, Henrichs J, Klimstra TA, Janneke B M, Maas A, Vreeswijk C, Meeus W & van Bakel H. Longitudinal Associations Between Parental Bonding, Parenting Stress, and Executive Functioning in Toddlerhood. *Journal of child and family studies.* 2017;26(6),1723–1733. <https://doi.org/10.1007/s10826-017-0679-7>
17. Nordahl D, Rognmo K, Bohne A, Landsem IP, Moe V, Wang C & Høifødt RS. Adult attachment style and maternal-infant bonding: the indirect path of parenting stress. *BMC psychology.* 2020;8(1), 58. <https://doi.org/10.1186/s40359-020-00424-2>
18. Doaltabadi Z & Amiri-Farahani L. The effect of in-person and virtual prenatal care education of the spouses of primiparous women on the father and mother's attachment to infant: a quasi-experimental and controlled study. *Trials.* 2021;22(1), 588. <https://doi.org/10.1186/s13063-021-05559-0>
19. Lindgren K. A comparison of pregnancy health practices of women in inner-city and small urban communities. *Journal of obstetric, gynecologic, and neonatal nursing:JOGNN.* 2003;32(3),313–321. <https://doi.org/10.1177/0884217503253442>
20. Roxanne B, Laura V, Yannic VG, Natacha VC, Luka VL & Kuipers YJ. Validation of the postpartum bonding questionnaire: A cross-sectional study among Flemish mothers. *Midwifery.* 2022;107, 103280. <https://doi.org/10.1016/j.midw.2022.103280>
21. Klier C. Mother–infant bonding disorders in patients with postnatal depression: The Postpartum Bonding Questionnaire in clinical practice. *Arch Womens Ment Health.* 2006; 9, 289–291. <https://doi.org/10.1007/s00737-006-0150-z>
22. Rossen L, Mattick RP, Wilson J et al. Mother–Infant Bonding and Emotional Availability at 12-Months of Age: The Role of Early Postnatal Bonding, Maternal Substance Use and Mental Health. *Matern Child Health J.* 2019;23, 1686–1698. <https://doi.org/10.1007/s10995-019-02809-1>
23. Babu MS, Chan SJ, Ein-Dor T, & Dekel S. Traumatic childbirth during COVID-19 triggers maternal psychological growth and in turn better mother-infant bonding. *Journal of affective disorders.* 2022;313,163–166. <https://doi.org/10.1016/j.jad.2022.06.076>
24. WHO, Child and Adolescent Mental Health. WHO. 2022 [http://www.who.int/mental\\_health/maternal-child/child\\_adolescent/en/](http://www.who.int/mental_health/maternal-child/child_adolescent/en/). (Accessed 13 August 2022)

25. Fransson E, Sörensen F, Kunovac Kallak T, Ramklint M, Eckerdal P, Heimgärtner M, Krägeloh-Mann I & Skalkidou A. Maternal perinatal depressive symptoms trajectories and impact on toddler behavior - the importance of symptom duration and maternal bonding. *Journal of affective disorders*. 2020;273, 542–551. <https://doi.org/10.1016/j.jad.2020.04.003>
26. Woody CA, Ferrari AJ, Siskind DJ, Whiteford HA & Harris MG. A systematic review and meta-regression of the prevalence and incidence of perinatal depression. *Journal of affective disorders*. 2017;219,86–92. <https://doi.org/10.1016/j.jad.2017.05.003>
27. Tichelman E, Westerneng M, Witteveen AB, van Baar AL, van der Horst HE, de Jonge A, Berger MY, Schellevis FG, Burger H & Peters LL. Correlates of prenatal and postnatal mother-to-infant bonding quality: A systematic review. *PloS one*. 2019;14(9),e0222998. <https://doi.org/10.1371/journal.pone.0222998>
28. Wiguna T & Ismail RI. Validation study of Indonesian mother-infant bonding scale. *Asian journal of psychiatry*. 2019; 43, 60–64. <https://doi.org/10.1016/j.ajp.2019.05.003.7>